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USAWC MILITARY STUDIES PROGRAM

OPERATIONS RESEARCH AND THE US ARMY

INDIVIDUAL ESSAY

by

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7 April 1983

ABSTRACT

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A descriptive analysis of operations research and how it has been used by the US Army culminates in the view that decision makers and analysts both have a role to play in ensuring that operations research makes a positive contribution to the management of the Army. The history of operations research is presented along with an introduction to underlying concepts. Army use of operations research is outlined including a discussion of the 1978 review of Army analysis and the resulting structural changes.

The purpose of this paper is to provide a descriptive analysis of operations research with a focus on its use by the US Army. The definitions of Operations Research (OR) number almost as many as there are practitioners. Simply stated,

> Operations Research is the application of mathematical techniques to operational problems, providing management with factual, quantitative reports on the relative merits of all potential courses of action.[1]

The definition cited by the Department of Defense is :

> The analytical study of military problems, undertaken to provide responsible commanders and staff agencies with a scientific basis for decision on actions to improve military operations. Also known as operational research, operations analysis.[2]

This paper consists of: an historical overview; a discussion of the underlying concepts of operations research; some of the tools used by analysts to aid decision makers in selecting the best course of action; how the Army uses operations research and, finally, the current organization for Army analysis along with a view of the future use of operations research by the Army.

HISTORY OF OPERATIONS RESEARCH

The roots of operations research are difficult to trace but the need for operations research began to manifest itself during the first industrial revolution. As firms grew, their growth fueled by machines and improved communications and transportation systems, it became increasingly difficult for a single manager to manage effectively. Managers began to divide their tasks among assistants. New areas of applied science were

conceived to aid these assistants in their specific areas of responsibility, e.g. chemical engineering, mechanical engineering, industrial engineering, and market research.

The area in which applied science was sorely needed, that of the executive whose task it was to integrate the activities of the multitude of assistants, was left without needed scientific tools. Tools were needed to assist in the executive functions of establishing objectives for, and measures of, the performance of the functions for which the assistants were responsible.[3]

Military organizations experienced the same type of organizational trauma as industry and managerial functions such as adminstration, intelligence, operations and training, and supply and logistics emerged. Even these areas were subdivided as specialized staff areas, sometimes under the parent function and occasionally directly under the commander. As early as World War I, F. W. Lanchester and Thomas A. Edison were working on models of combat superiority and antisubmarine warfare respectively. Lanchester's quantitative rules for combat are still used in some war games today.

Between the end of World War I and the beginning of World War II military technology "developed more rapidly than it could be absorbed effectively into military tactics and strategy."[4]

World War II is usually identified as the period when operations research was first recognized as a credible and effective field. The British Air Ministry set up a team of scientists and military personnel to perform "operational" research on such military problems as: air and coastal defense and coordination of fighters and antiaircraft guns with radar; the number and mix of aircraft for bombing missions--formation, load, and drop techniques; and, antisubmarine warfare--search patterns, depth charge deployments, and convoy tactics. Their successes were brought

to the attention of the United States who also formed teams to assist in military decision making.[5] By V-J day the US Army Air Corps had 17 different operations research sections, one working for each combat air force. They studied such things as bombs, fuses, bombing accuracy and battle damage. Two of the greatest stumbling blocks to the effective use of operations research were convincing the decision makers that scientists could help them and convincing the scientists that they weren't the decision makers.[6]

At the close of World War II operations research was expanded in the United States while most of the experienced operations research workers remained in the service of the military. A number of institutions, closely tied to the military services, were founded where scientists of varied disciplines could continue to work on tactical and strategic problems for the military services. The most well known of these institutions, the RAND Corporation, was formed by the Air Force as a non-profit organization to provide technological advice.[7]

By the early 1950's the public recognized operations research as having potential and elevated it to a position of value in industry. The analytical techniques applied to military problems during the 1950's were spinoffs from those techniques applied during World War II, expanded to handle the more complex problems of development of weapon systems for future wars. The analysts of the 1950's found it necessary to address aggregated rather than individual effects and to establish a broader concept of objectives than the operations research analysts of World War II who worked on specific and immediate problems.[8]

In the 1960's one individual, Robert S. McNamara, had a profound impact on analysis as a facilitator of decision making in the Department of Defense. Under his direction an extension of operations research

identified as systems analysis was introduced. Systems analysis is more complex than OR since its focus is more on what should be done rather than how it should be done. It was called systems analysis primarily because it dealt with the analysis of systems, usually weapon systems. A system was defined as an "interconnected assemblage of functionally related objects."[9] McNamara's critics attacked his systematic computational approach to decision making because they believed that the need for value judgments was essentially ignored to the detriment of the final decision which often resulted in designed mediocrity.[10] A disciple of McNamara, James R. Schlesinger, stated in a 1966 RAND paper that the "centrally controlled planning in the Department of Defense since 1961 must be regarded as one of the major planning experiments of all time."[11] He described the goal of the analytically based decision making system as improving statistically the quality of decisions. While stating that the McNamara regime made at least as many errors as its predecessors, the aggregate cost of those errors was small in part because of the analysts contributions to the decision makers.[12]

Schlesinger's discussion of the impact of cost-effectiveness analyses in the determination of force structure decisions is particularly enlightening. He recognized the important and clearly distinguishable roles played by the technical analyst and the military decision maker. The systems analyst tends to examine the hypothetical future in his assessment of objectives and alternatives without regard to experience. The human element tends to be disregarded since it is difficult to analyze. Only the military professional has the experience necessary in the all important intangible factors to contribute the element of intuition to the final decision. Schlesinger stated, "The military professionals have recognized, quite correctly in my view, that all decisions must ultimately be based on

intuition."[13] Thus we have seen the need for the military decision make and the technical analyst to clearly understand each others role in the decision making process.

McNamara's analytical approach to decision making still permeates the Department of Defense today and remains a driving force in the resource allocation process.

UNDERLYING CONCEPTS OF OPERATIONS RESEARCH

The basic approach to a problem using operations research involves the following: (1) formulation and statement of the problem; (2) collection of data relevant to the problem; (3) analysis of the data leading to construction of a model that best describes the situation; (4) testing and manipulation of the model to determine outcomes under various circumstances; (5) selection of the optimum solution; (6) presentation of results to the decision maker while continuing to check the validity of the model in view of new data; and (7) after a decision on the course of action, continued analysis during execution to keep the decision makers abreast of progress and change. While the approach may appear to be straight forward and easily executed, a closer look at each step reveals the difficulty and pitfalls that face both the analyst and the decision maker.

The first step (formulation and statement of the problem) is the most important to the overall value of the analysis. Too often we fail to ask--what's the question? The formulation of the problem is in fact an analytical process in itself. It is not uncommon to find that after a thorough investigation of the request for analysis that the statement of the problem bears little resemblance to the problem stated in the request. Occasionally the analyst may find that the elements of the problem can't be quantified and may not lend themselves to analysis.

The key to the success of analysis is the close coordination between the analyst and the decision maker in arriving at the statement of the problem and the analytical plan. At the same time the identification of decision criteria should take place. Unduly restricting the analysis or taking on too big a task can invalidate the results of the analysis, wasting valuable time and other resources in the process.

The second step, that of gathering relevant data, determines the quality of the analysis.[14] Here the decision maker can be of assistance to the analyst by opening doors to various data sources that might otherwise remain closed by those protecting their turf from prying eyes. The data gathering process is truly never completed until execution of the decision is completed.

The next steps of model construction, testing and manipulation are fraught with pitfalls. Often the analyst is equipped with only a few or perhaps only one model. One tendency is to force fit the problem into an existing or favorite model by making changes only at the margin of the model. While this approach may work and in fact may be dictated by the time and funds available, it highlights the need to test the model to be certain it represents the desired portion of the real life situation being examined. Since the output of the model is dependent upon the assumptions, the models sensitivity to these assumptions must be tested because high sensitivity to small changes in the assumptions could invalidate the analysis.

A technique of analysis known as linear programming can be used to analyze such areas as unit readiness and allocation of fires. As a tool used in the management and economic fields, it is recognized as effective in the allocation of resources.

Multiple regression analysis is a prediction technique used to relate the simultaneous impact of several variables to produce estimates. It has value in the military in the area of consumption rates of supply.

Network flow analysis is based on a flow of activities and has been widely used in the study of road nets, traffic patterns, and in production planning and execution. It has been used in studying the operational elements of military activities. Frequently linear programming and gaming are an adjunct to network analysis.[15]

Another tool for analysis is gaming. Peculiar to gaming is the fact that future outcomes are controlled by our competitor--usually assumed to be a rational being.[16] War gaming is widely used in the military from the area of relatively small unit tactics to strategic nuclear exchange models.

Discriminant function focuses on the relative contribution of various influences to some distinction, be it success or failure of a particular campaign or a type of tactics. It has seen military application where actual combat data was analyzed to derive weights of firepower sources.[17]

The final step is the selection of the optimum solution and presentation of results to the decision maker in accordance with the decision criteria agreed upon earlier. At this point the analyst is faced with the task of translating the solution back to the real world and presenting the solution in terms the decision maker can relate to the problem being addressed.[18] The analyst must also address the shortfalls of the analysis and the sensitivity of the results to the assumptions.

The analyst must continue to refine his analysis during the execution phase as real world data appears and displaces data derived from or extant in the model. Clearly significant changes must be brought to the attention of the decision maker.

The lesson to be learned by the decision maker from this brief discussion of underlying concepts is "that a questioning attitude is key to both the understanding and the use of analysis."[19]

ARMY USE OF OPERATIONS RESEARCH

After World War II an all-civilian agency was established by the Army called the Operations Research Office (ORO). It was established at Department of the Army level to deal primarily with weapons' effectiveness. It considered such areas as lethality, cost, and logistical support requirements. The ORO received little popular support from within the Army most likely because at the time many Army field leaders mistrusted those who attempted to use scientific methods to study ground warfare.[20] In general, the Army's analysis program trailed those of the other services. This can be attributed to the difficulty encountered in the application of analytical concepts to ground forces. The Antiballistic Missile (ABM) system effort absorbed most of the Army's analytical effort as late as 1967.[21]

Some analytical effort was expended to study the combat development field with the goal of recommending improvements. Efforts by a research team composed of civilian scientists and military technicians beginning in 1952, working with soldiers in field environments, failed to live up to expectations.

The need to study the ground combat environment remained and in 1959 the Army formed the Experimentation Command at Fort Ord, California. In 1962 it became a part of the Combat Developments Command. Experiments were conducted to determine the relative effectiveness of infantry squads armed with a variety of weapons using various types of ammunition. The final result of the series of experiments showed that squads armed with 5.56mm

weapons were superior to those armed with 7.62mm weapons in the areas of target effects, sustainability of effects and overall effectiveness.[22] The adoption of the M-16 rifle (5.56mm) as the basic weapon for soldiers followed.

Early in the Vietnam conflict the Army made a decision to increase the number of helicopters in Vietnam from about 100 to ultimately thousands. This decision was made in the face of an increasing enemy antiaircraft capability. Conventional military wisdom recommended against the increase in the helicopter force but operations analysis of objective documentation indicated that helicopters could in fact survive in the Vietnam antiaircraft environment. The result was a loss rate per sortie 2 1/2 times less than the rate when there were 100 helicopters in Vietnam.[23]

Many other examples of the use of analysis to improve ground combat efficiency during the Vietnam conflict exist. Special Forces efforts to improve the combat efficiency of their camps in terms of operations, intelligence, and coordinated action met with success certainly in part because of operations research techniques. The analysis showed that the camps were not taking full advantage of US strengths in combat units, mobility, airpower, and fire support.[24]

The Army organized the Army Concept Team in Vietnam (ACTIV) as an impartial group to conduct materiel evaluations and combat developments in the combat zone. The organization was made up of military officers and scientists who were formed into teams to analyze specific areas. Some of the areas addressed were use of armored cars, navigation aids, aircraft employment, and safety.[25]

A 1974 monograph examines the use of operations research techniques in Vietnam. Sharpening the Combat Edge: The Use of Analysis to Reinforce Military Judgment, written by Lieutenant General Julian J. Ewell and Major

General Ira A. Hunt, Jr., focuses on the use of analysis in combat operations and the integration of that analysis with military judgment in solving a multitude of problems during the period 1968-1970.[26] A brief summary of the salient conclusions of the monograph are: (1) "the judicious use of operations analysis and analytical techniques when melded with military judgment was quite effective in improving performance in many areas of activity;" (2) best results were achieved at Division level--analysis was more difficult to apply with precision at higher echelons; (3) "the individual commander's ability, skill and knowledge transcended the more tangible factors;" (4) "many aspects of the situation resisted analysis."[27] The overall analytical thrust was on results vice on the activity itself. This helped to better understand the salient points of complex operations. The bottom line of the monograph stated that "a measured and rational development of combat analysis as a tool of command deserves emphasis in the future."[28]

During the 1970's the organization and structure for conduct of analysis in the Army remained relatively unchanged. Figure 1[29] shows the location of Army Studies and Analysis personnel resources in 1978. It is apparent that, from the viewpoint of resources, Army analytical activity is spread throughout the Army in a variety of organizations whose missions run the gamut from pure studies and analysis to operational command of forces. It is also clear that the preponderance of the resources are placed in the Headquarters, Department of the Army, the Materiel Development and Readiness Command (DARCOM), and the Training and Doctrine Command (TRADOC). The operational commands (lower right of Figure 1) have few resources. With regard to overall direction of the Army's studies and analysis in the 1970's, it could be best described as decentralized tasking and execution.

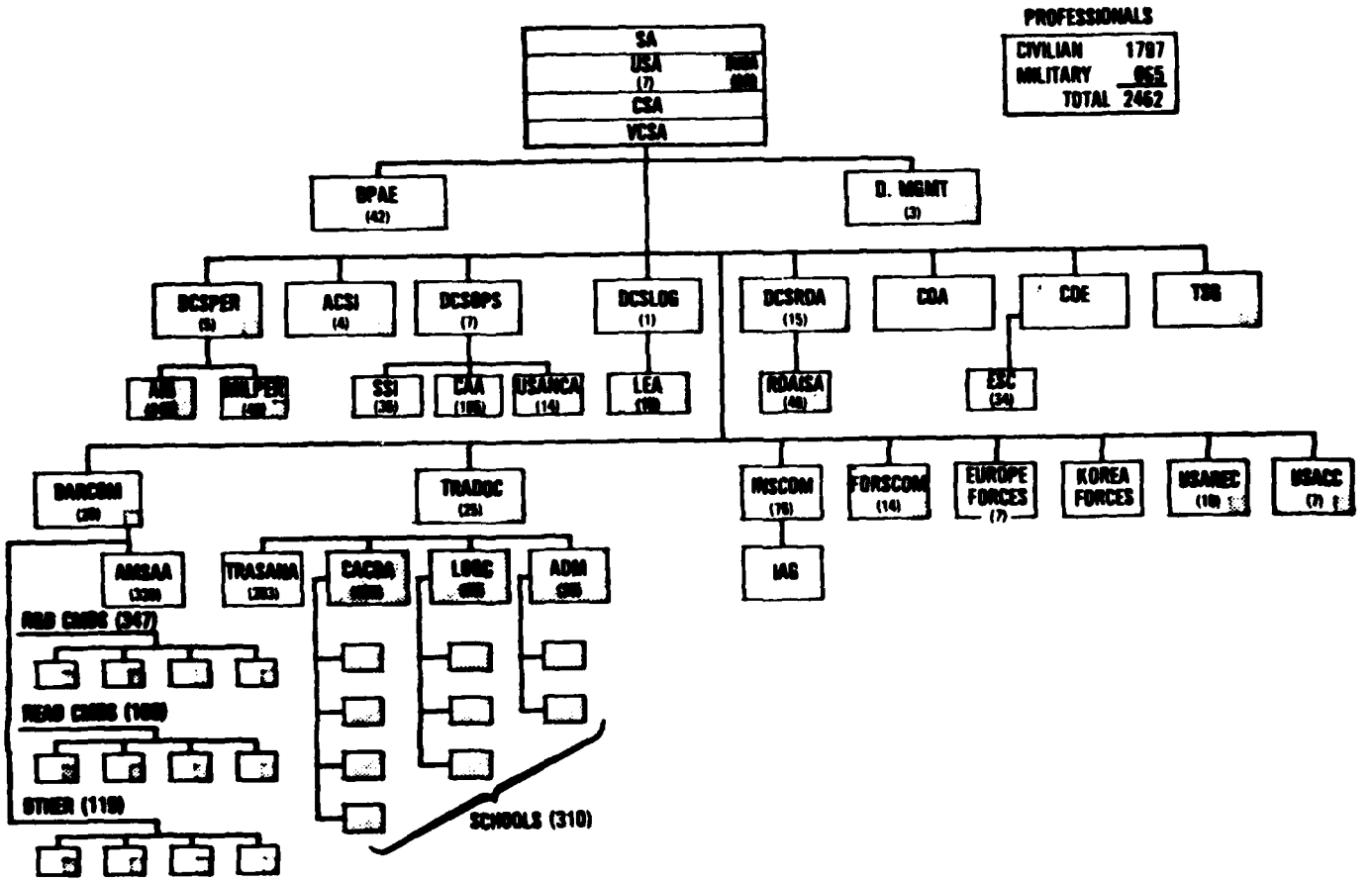


FIGURE 1: Locations of Army Studies and Analysis Resources

It is important to note that cost analysts are considered a part of the financial management arena and are not included in Figure 1 nor in this discussion. Also excluded were analysts who support test activities and analysts who work in Project Manager's offices. These exclusions are a function of the source data rather than a conscious exclusion on the part of the writer. Table 1[30] shows the Army Studies and Analysis Community Organizations while Figure 2[31] shows a breakout of the community by type of areas studies and the personnel resources dedicated to those areas. The estimated cost of the Army's Fiscal Year 1978 analysis program was 139 million dollars, only 17% of which was used to support contracted work.

Table 1 Army Studies and Analysis Community Organizations

Headquarters, Department of the Army

- Office Deputy Under Secretary of the Army (Operations Research)
- Study Management Office, OCSA
- Technical Advisor Office, ODCSOPS
- System Review and Analysis Office, ODCSRDA
- Advisor for Research, Development and Acquisition, ODCSRDA
- Study Management Office, ODCSLOG
- Red Team, OACSI
- Program Analysis and Evaluation, OCSA

Strategic Studies Agencies/Field Operating Agencies

- Strategic Studies Institute
- Concepts Analysis Agency
- Army Nuclear and Chemical Agency
- Army Research, Development and Acquisition Information System Agency
- Logistics Evaluation Agency
- Army Research Institute
- Military Personnel Center
- Army Recruiting Command
- Engineer Studies Center

Major Commands

- US Army Europe
- US Army Intelligence and Security Command
- US Army Communications Command
- US Army Forces Command

US Army Training and Doctrine Command

DCS, Combat Development--Analysis Directorate
TRADOC Systems Analysis Activity
Combined Arms Combat Development Activity
Logistics Center
Admin Center

Schools/Centers

Armor
Artillery
Air Defense
Infantry
Aviation
Engineer
Transportation
Quartermaster
Missile and Munitions
Intelligence
Signal
Military Police
Ordnance and Chemical

US Army Materiel Development and Readiness Command

Battlefield Systems Integration Directorate
Systems Analysis Division
Armament Materiel Readiness Command
Communications and Electronics Materiel Readiness Command
Missile Materiel Readiness Command
Tank-Automotive Materiel Readiness Command
Troop Support and Aviation Materiel Readiness Command
Armament Research and Development Command
Aviation Research and Development Command
Communications Research and Development Command
Electronics Research and Development Command and Harry Diamond Laboratories
Mobility Equipment Research and Development Command
Missile Research and Development Command
Natick Research and Development Command
Tank-Automotive Research and Development Command
US Army Materiel Systems Analysis Activity
US Army Management Engineering Training Agency
Depot System Command
Inventory Research Office
Logistics Studies Office
Logistics Control Activity
Security Assistance Center
Procurement Research Office

Figure 2 The Army Study Community (Number of professional personnel)

Headquarters Elements		OR/SA Studies of Systems	
Army Secretariat -	7	Operational Commands -	28
Headquarters DA Staff -	35	CAA -	185
Headquarters TRADOC -	25	TRADOC Centers -	200
Headquarters DARCOM -	7	TRADOC Schools -	310
	74	TRASANA -	203
		AMSAA -	320
			1246

Strategic Studies
SSI--35

Scientific/Engineering Studies of Elements of Systems

USAREC	-	10	
ARI	-	241	PEOPLE
MILPERCEN	-	48	
LEA	-	15	LOGISTICS
USANCA	-	14	NUCLEAR
BSI	-	13	HARDWARE
DARCOM ORGANIZATIONS		556	
RDAISA	-	48	R&D INFORMATION
ESC	-	34	ENGINEER PLANS
		979	

It is important to understand the role of operations research, studies and analysis in the Army of the 1970's. Figure 3[32] shows some definitions that are pertinent while Figure 4[33] briefly states the role.

Figure 3 Basic Definitions

STUDY	- A CAREFUL EXAMINATION OF A PHENOMENON, DEVELOPMENT OR QUESTION
ANALYSIS	- AN EXAMINATION OF A COMPLEX, ITS ELEMENTS, AND THEIR RELATIONS
OPERATIONS RESEARCH	- THE APPLICATION OF SCIENTIFIC AND ESPECIALLY MATHEMATICAL METHODS TO THE STUDY AND ANALYSIS OF PROBLEMS INVOLVING COMPLEX SYSTEMS (AS FIRM MANAGEMENT, ECONOMIC PLANNING, AND THE WAGING OF WAR)
SYSTEM	- REGULARLY INTERACTING OR INTERDEPENDENT ITEMS FORMING A UNIFIED WHOLE

Figure 4 Role of Army Operations Research, Studies and Analysis

ANSWER QUESTIONS (AND SOMETIMES ASK THEM)

SOLVE PROBLEMS (AND SOMETIMES IDENTIFY THEM)

ILLUMINATE ISSUES (AND SOMETIMES DEFINE THEM)

THE AIM: INCREASE UNDERSTANDING, NOT TO DECIDE

A special study group was formed in 1978 to review the analytical capability of the Army and to propose practical improvements. The review was directed because Army analysis had received some criticism with regard to quality and credibility. Some of the criticism included:

(1) several cost and operational effectiveness analyses have required second efforts;

(2) cost and schedule projections of acquisition programs have not been uniformly accurate;

(3) performance of hardware item systems often has not been analyzed in a sufficiently representative set of battlefield conditions;

(4) quality and value of some of the human resources related studies have been marginal;

(5) obvious alternatives to significant proposed changes to Army organizations . . . have not been analyzed well; and

(6) alternatives to major force structure change proposals, such as conversion of light divisions to heavy divisions, apparently have not been analyzed well.[34]

In general terms there was a concern that the decentralized management of Army analysis resources was inefficient. The fact that Congressional support for analysis programs had been decreasing also added fuel in favor of a review and tighter control of resources.

The recommendations resulting from the review were, for the most part, approved by the Vice Chief of Staff of the Army for implementation. Some of the more significant changes made were as follows: (1) study guidance and programs will be approved at the highest levels of the Army; (2) Concepts Analysis Agency (CAA) will be assigned to the Director of the Army Staff and provide analytical support to the entire Headquarters, Department of the Army Staff; (3) CAA's mission will be enlarged to include personnel and logistics areas; (4) the analytical capability of the Combined Arms Combat Development Activity (CACDA) will be increased and the mission will be enlarged; and (5) a Study Program Coordination Committee (SPCC) will be formed to function within the usual Programming, Planning and Budgeting System.[35]

During late 1981 a new Army Regulation was published to implement the changes generated by the review. "This regulation prescribes policies, responsibilities, and procedures for improving the quality of Army studies and analyses and the efficiency of use of resources."[36] The following is a synopsis of the management of Army studies and analysis. The Army study and analyses community encompasses that area of activity characterized by the application of the tools of operational or systems analysis to Army problems. The purpose of this activity is to provide analytical examinations to aid Army decision makers through greater understanding of relevant issues.

Study categories within the Army include: (1) manpower and personnel; (2) concepts and plans; (3) operations and force structure; (4) installations and logistics; (5) science, technology, systems, and equipment; (6) management; (7) intelligence; and, (8) international security.

The objectives of the new management scheme for Army studies and analysis include (1) the allocation of resources to insure attention to critical Army issues, an equitable share of resources among near-term, mid-term, and long-term problems; (2) provide a means of insuring only high quality and high payoff studies are conducted; (3) provide for review and analysis of performance of the entire study program; (4) provide adequate budget and program data; and, (5) minimize administrative procedures and controls.[37]

In broad terms it is intended that Army studies be managed by centralized guidance with decentralized program development and centralized review and monitoring. The management program provides for major commands, e.g. DARCOM and TRADOC, submission of their proposed annual study program based on their requirements. Major commands also prepare evaluations of the results of their study programs and submit them annually to Headquarters, Department of the Army where they are combined into an evaluation of the Army Study Program and submitted to the Office of the Secretary of Defense.

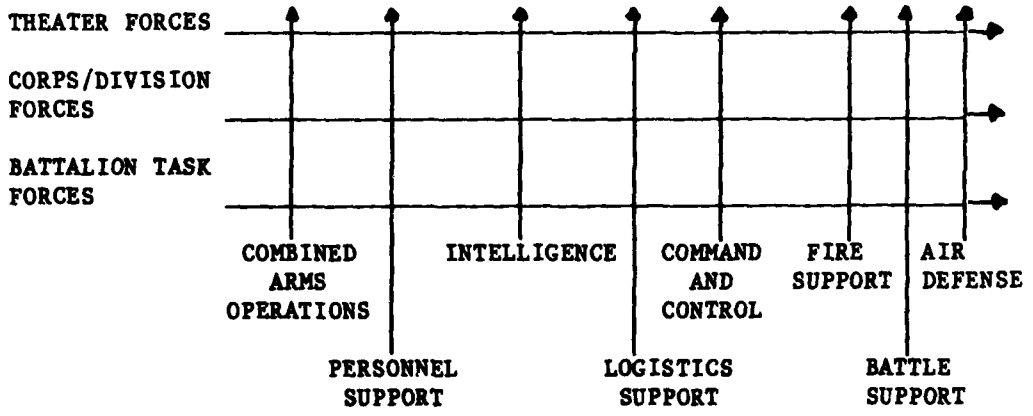
While it is too early to evaluate the results of this new management approach it appears that it should provide some improvement in the overall Army studies and analysis effort.

Training and Doctrine Command has undertaken some major changes in its approach to operations research. First the TRADOC Operations Research Activity (TORA) was established at Headquarters, TRADOC to provide centralized management of analytical activities within the TRADOC and provide the interface with Headquarters, Department of the Army. Combined Arms Combat Development Activity (CACDA) has received an enlarged mission under TRADOC and redesignated the Combined Arms Operations Research Activity (CAORA). The new mission of CAORA is to serve as the TRADOC center of analysis for

combined arms combat and training developments. It has responsibility for studies from the brigade level through echelons above corps related to doctrine, logistics, and materiel combat developments. Also CAORA designs, develops and provides software maintenance of battlefield simulations for combined arms staffs from platoon level through corps. It also develops TRADOC standard scenarios and serves as a approval authority for all scenarios used for combat development.

Another area that is being improved as a result of the review of Army studies and analysis is that of an Army Model hierarchy. This concept is designed to interrelate models with regard to functional areas and with levels of organization. Figure 5 shows the structural concept in general terms.[38]

Figure 5 ARMY MODEL HIERARCHY



Improvements in computer hardware and software are underway to insure state of the art equipment. Internetting feasibility is being studied and work has started on an integrated data base.

Efforts are also ongoing to fill authorized military Operations Research Systems Analysis (ORSA) positions in TRADOC where fill is now only about 60% of authorized. While there is no shortage of applicants for

these positions the problem lies in the lack of sufficient quotas for advanced degrees in hard sciences to qualify officers. CAORA, which has the proponency for this career field, is exploring other means to assist officers in gaining the necessary educational background to qualify for ORSA positions.

FUTURE OF OPERATIONS RESEARCH IN THE ARMY

It is clear that operations research is well ensconced in the structure of the US Army. While the preponderance of analysts lie in the higher echelons the impact of their efforts will be felt more and more throughout the entire Army as improvements in training, doctrine, and materiel reach the soldier in the field. This is not to imply that the analysts are making decisions regarding the improvements (at least they shouldn't be) but that their contributions to the decision making process have been instrumental in getting the best product for the dollar and reducing the likelihood of large errors.

Much work remains to be done to insure that operations research assets are used in the best manner to assist the Army as a whole. First, it is necessary that decision makers at all levels gain a full understanding of the capabilities and limitations of operations research and the products that flow from it. They must learn to question the analyst in order to gain confidence that his conclusions make good sense, and if they don't make good sense, why not.[39]

Second, the analysts must guard against overestimating their capabilities lest their credibility be tarnished by unsound conclusions and recommendations. Ever since the McNamara era there have been those who have criticized the analysts in the Department of Defense and some of that

criticism has certainly been justified. R. James Woolsey, Under Secretary of the Navy from 1976 to 1979 stated in April 1980 as follows:

> Analysts, as individuals, may well make some further important contributions as many have already. Many are very wise and bright people. But as keepers of a supposedly neutral and comprehensive mechanism for assessing and balancing all of the relevant factors for decision making about defense, as priests of this new faith that breezed into town nearly two decades ago, my suggestion to the analytical community would be the same as that made by Oliver Cromwell to the Long Parliament, 'You have sat too long in that place for any good that you may be doing. Go and let us have done with you. Go. In the name of God, go.'[40]

While I certainly do not agree that analysts should be expelled from the Army, I do believe that they should be aware that there is an ever present need to guard against presenting themselves as the all-knowing and infallible possessors of the solutions to all the Army's problems. A healthy, open and honest relationship with the decision makers will go a long way toward insuring that the Army analytical community will make a most valuable contribution to the Army of the future.

With regard to the career officers in the Army, while no requirement exists for them to become fully qualified analysts, it is essential that they become proficient in employing analytical products to aid in improving those military operations for which they might be responsible.

Thus, the future of operations research in the Army belongs to the decision makers as well as the analysts. Only time will tell whether this marriage will last or end in divorce.

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